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2014 PROGRESS REPORT

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Who We Are

In all, nearly 200 organizations have become partners in JFSP-sponsored research.

The Joint Fire Science Program (JFSP), organized in 1998, works to improve the overall effectiveness of federal wildland fire management by providing and implementing scientific information and tools into land and resource management plans. The JFSP provides information for agencies to treat hazardous fuels successfully, reduce the threat of severe wildland fires, and restore or maintain the appropriate role of fire in ecosystems. This information improves agencies' abilities to improve firefighter safety, control wildland fire suppression costs, protect the public, and sustain healthy ecosystems.

The JFSP is uniquely positioned to tailor wildland fire research in response to the emerging needs of policymakers and fire managers. An annual cycle of proposal solicitation, review, and funding ensures timely

response to evolving conditions. Research projects complement and build on other federal research programs, such as those in the U.S. Forest Service and Department of the Interior agencies. Synthesis of research findings and targeted delivery to managers are essential components of the program.

More than 90 colleges and universities have collaborated on and partnered with JFSP-sponsored research projects. By engaging masters and doctoral candidates in these projects, the JFSP is training the next generation of resource managers and scientists. This collaboration extends to private and nonprofit organizations and tribal, state, county, and local governments. In all, nearly 200 organizations have become partners in JFSP-sponsored research. This publication reports the JFSP's 2014 highlights and progress.



JFSP Fire Science Exchange Network leaders.

The JFSP Fire Science Exchange Network: Successful and Growing!

Each year, half of the JFSP Fire Science Exchange Network conducts a national evaluation survey administered by the University of Nevada at Reno. Customer responses continue to be quite positive. The evaluation is part of a process to renew funding, which occurs every 2 years. Consumers (fire and land managers), producers (scientists), and the general public provided opinions and descriptions of experiences regarding the fire science exchanges and the delivery of the latest scientific information. What exactly are JFSP customers saying about the fire science exchanges?

- "These findings indicate that the consortia (exchanges) are making substantial progress toward their shared goal of increasing fire science accessibility."
- "Consumers (managers) were more likely to apply what they have learned."
- "There are significant perceptions that consortia are helping to improve the application of fire science information and communication between fire managers/practitioners and researchers/scientists."

When statistically comparing differences from year one to year two, management respondents were more likely to agree that:

- Fire science information is easy to find and understand.
- During the past year, I have changed at least one thing in my work based on what I've learned about fire science.
- The exchange has helped improve the use and application of fire science information in my region.
- The exchange has helped improve communication among managers and scientists in my region.
- I would recommend exchange involvement to my coworkers.

The JFSP would like to introduce the 15th member to the JFSP Fire Science Exchange Network—the North Atlantic Fire Science Exchange. See figure 1 for the names and locations of all fire science exchanges within the JFSP Fire Science Exchange Network.

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Figure 1. JFSP Fire Science Exchange Network

Fire Science Exchanges: Learning on the Ground

In 2013, the fire science exchanges implemented 7,500 activities—an increase of 47 percent over the prior year!



Photo: Marjie Brown - Firescience.gov

Northern Rockies Fire Science Exchange - Fires of 2000 Tour.



Oak Woodlands Fire Science Exchange - Timber Quality and Prescribed Fire Workshop.

Customer growth is up 16 percent from 2012, reaching almost 8,000 members.

Annual Research Solicitation – Tough Competition

Each year, the JFSP develops research questions driven by the priorities of fire and land managers. In September, those questions are distributed to scientists throughout the world. Once the solicitation closes around the end of November, expert peer review panels convene to examine every proposal. The review

panels forward their recommendations to the JFSP Governing Board for funding decisions in the spring. In 2014, of the 209 proposals received, 42 were selected (20 percent), totaling \$10,840,704. Table 1 summarizes the solicitation by task number and research topic.

Each year, the JFSP develops research questions driven by the priorities of fire and land managers.

Table 1. 2014 research solicitation summary by task number and research topic

Task Number	Research Topic	Proposals Received	Proposals Selected	Total Funded
14-1-01	Fuels treatment effectiveness across landscapes	21	6	\$1,937,534
14-1-02	Influence of past wildfires on wildfire behavior, effects, and management	21	5	\$1,610,620
14-1-03	Contribution of smoke emissions to secondary organic aerosols	15	2	\$655,489
14-1-04	Effects of smoke from wildland fires on human health in urban centers	15	3	\$1,255,807
14-1-05	Compatibility of fire and fuel treatments with threatened and endangered bats	17	3	\$911,767
14-1-06	Effects of wildfire on water	31	5	\$1,684,476
14-2-01	New science initiative – social science	31	5	\$1,178,541
14-3-01	Graduate Research Innovation (GRIN) award	38	7	\$163,544
14-4-01	JFSP fire science exchanges pre-proposals	2	1	\$56,000
14-5-01	Fuels treatment effectiveness: Landscape-level and programmatic economics	18	5	\$1,386,926
Grand total		209	42	\$10,840,704



Smoke monitoring equipment.

Photo: Tara Strand

Department of the Interior Request

Augmented by \$1 million from the Department of the Interior, Office of Wildland Fire, the JFSP solicited research proposals for "Fuels treatment effectiveness: Landscape-level and programmatic economics." The JFSP received 18 proposals and selected the following 5 projects:

1. **Programmatic analysis of fuel treatments: From the landscape to the national level**
Principal Investigator: Douglas Rideout, Colorado State University
2. **Do fuel treatment costs affect wildfire suppression costs and property damages: Analysis of costs, damages avoided, and return on investment**
Principal Investigator: Armando Gonzalez-Caban, U.S. Forest Service
3. **Spatiotemporal evaluation of fuel treatment and previous wildfire effects on suppression costs**
Principal Investigator: Helen Naughton, University of Montana
4. **Duration and cost effectiveness of fuel treatments in the Alaska boreal region**
Principal Investigator: Joseph Little, University of Alaska-Fairbanks
5. **Evaluating the economic returns of fuel treatments at multiple spatial scales: Accounting for treatment timing, method, and ecological conditions**
Principal Investigator: Kimberly Rollins, University of Nevada-Reno

The JFSP also contributed \$400,000 to fund this critical work. Figure 2 shows the distribution of funding by organization for all selected 2014 research proposals.

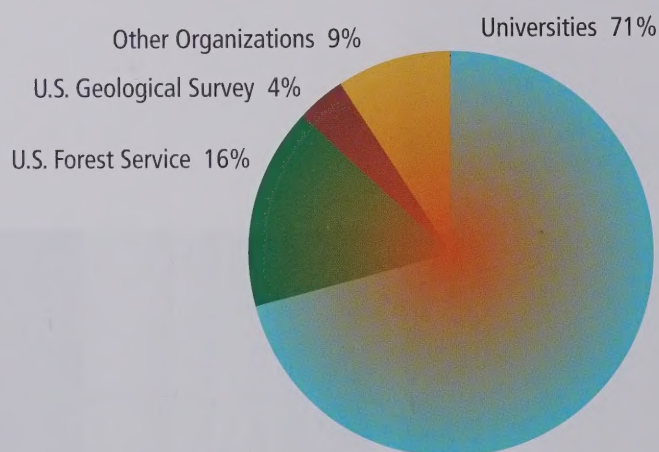


Figure 2. 2014 distribution of funding by organization

As of August 2014, 37 projects were completed in fiscal year 2014. Figure 3 shows the number of students who participated in these projects.

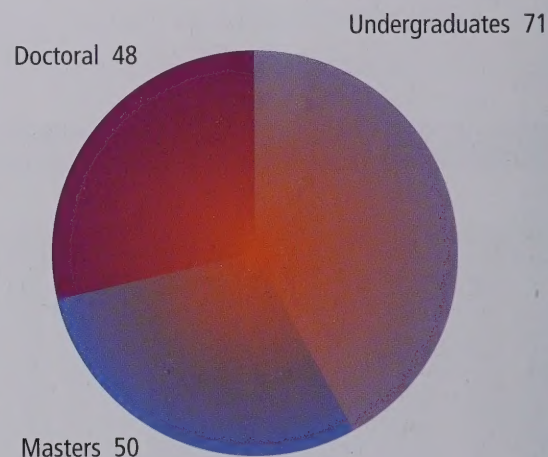


Figure 3. 2014 student participation on completed projects

Currently, 134 projects are active, and a total of 570 research projects have been completed since 1998.

Air Quality and Smoke Management Line of Work

Wildland fire smoke in the U.S. has been a controversial issue for air quality and fire management since the 1970s. Historically, the main air quality standard of concern is particulates—total suspended particulates, particulate matter ten microns or less in diameter (PM_{10}), and particulate matter 2.5 microns in diameter ($PM_{2.5}$). Other issues, such as visibility for traffic safety and regional haze, have also been concerns. Current smoke management issues include harm on public

health, long-term impacts on firefighter health, and smoke and climate change (including, but not limited to, black carbon concerns).

The satellite photo in figure 4 shows the extent of smoke deposited hundreds of miles away from the Rim Fire in California in 2013. However, the impact of the smoke emissions was felt across a much wider area of the Western United States and several Canadian provinces, as shown on the map in figure 4.

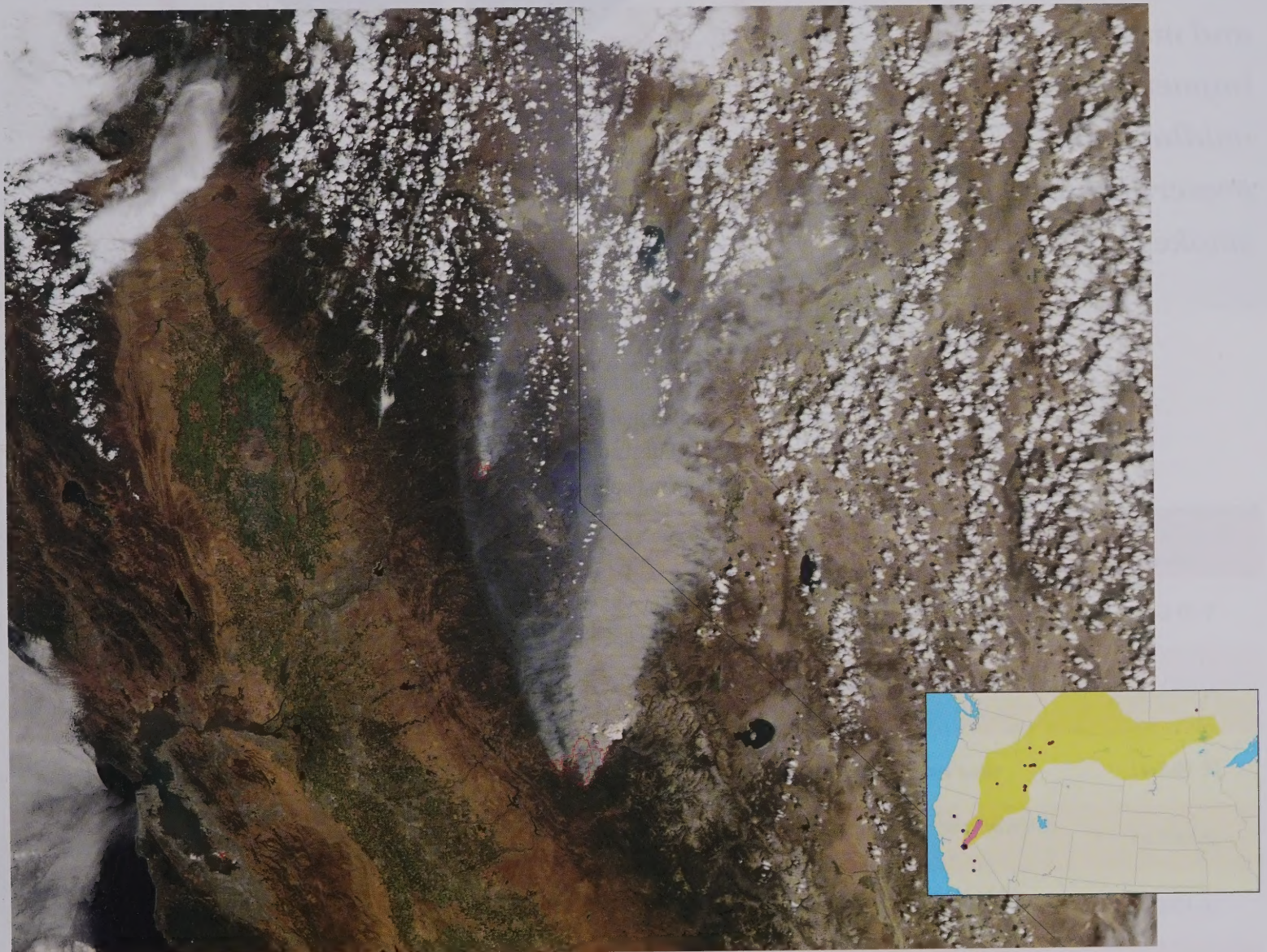


Figure 4. Smoke distribution from the Rim Fire in California (Source: National Oceanic and Atmospheric Administration's National Environmental Satellite, Data, and Information Service)

The JFSP smoke management line of work helps communities and managers predict and mitigate the impacts from wildland and prescribed fire smoke emissions.

The JFSP smoke management line of work helps communities and managers predict and mitigate the impacts from wildland

and prescribed fire smoke emissions. JFSP investments focus on four integrated themes, as depicted in figure 5.

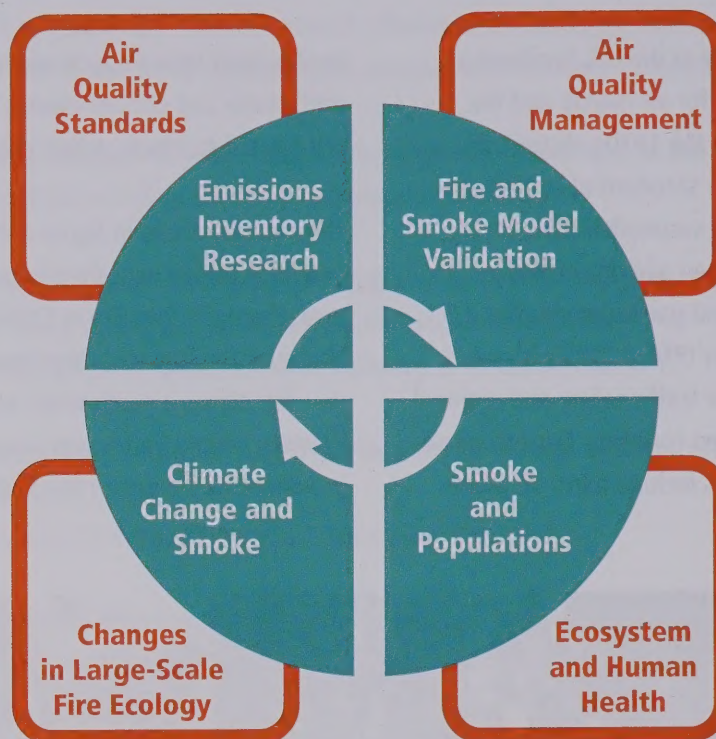


Figure 5. The four Smoke Science Plan themes are shown within the circle, while the drivers of each theme are identified in the boxes

In 2014, the JFSP funded two research projects under the topic "Contribution of smoke emissions to secondary organic aerosols." The JFSP funded three additional research projects under the topic "Effects of smoke from wildland fire on human health in urban centers."

In addition, five smoke line of work projects were completed in 2013, as shown in table 2. A webinar was created for each completed project in table 2 to help managers explain the importance of the research, results, and management implications.

Table 2. Smoke management line of work projects completed in 2013

JFSP Project Number	Title	Principal Investigator
12-3-01-6	Sensitivity Analysis of Air Quality to Meteorological Data in Fire Simulations	Mehmet Odman
12-5-01-2	Smoke Consequences of IPCC's Scenarios Projected Climate and Ecosystems Changes in the US - A Review Paper	Donald McKenzie
09-1-04-1	Development of Modeling Tools for Predicting Smoke Dispersion from Low-Intensity Fires	Warren Heilman
09-1-04-5	Superfog Formation: Laboratory Experiments and Model Development	Marko Princevac
08-1-6-09	Airborne and Lidar Experiments for the Validation of Smoke Transport Models	Shaun Urbanski

Student Innovation - Just for GRINs!

Since 2010, the JFSP has annually partnered with the Association for Fire Ecology to invite current graduate and doctoral students in U.S. colleges or universities conducting research in fire science to apply and compete for a Graduate Research Innovation (GRIN) award. Students receive awards for up to \$25,000. Since the award's inception, 153 proposals have been submitted, and 28 have been approved for funding.

The purposes of this award are to:

- Enhance graduate students' exposure to and interaction with fire and fuels managers.
- Develop appreciation and understanding of fire and fuels managers information and research needs.
- Augment already-planned research to develop information and/or products useful to managers.

In 2014, proposals were solicited for the following topics:

- Climate change and fire (e.g., fire behavior, fire effects, fire regime).
- Fuels management effectiveness and effects (e.g., treatment longevity, threatened and endangered or invasive species, carbon balance, pile burning, mastication treatments, wildland/urban interface issues).
- Smoke or emissions assessments.
- Social issues and fire (e.g., community preparation, transfer and use of science, public perceptions).

In 2014, students submitted 38 proposals, and the following 7 proposals received GRIN awards amounting to \$163,544, as shown in table 3. For more information on the GRIN award, go to www.firescience.gov/digest/fsdigest18.pdf.

Since the award's inception, 153 proposals have been submitted, and 28 have been approved for funding.

Table 3. 2014 projects funded with Graduate Research Innovation awards

Graduate Student	University	Project Title	JFSP Project Number
Adam Young	University of Idaho	Spatially explicit impacts of climate on past, present, and future fire regimes in Alaskan boreal forest and tundra ecosystems	14-3-01-7
Tyler Refsland	University of Illinois at Urbana-Champaign	Fire-based management for promoting drought resistance of woody seedlings in a changing climate	14-3-01-16
Tracy Swem	Michigan State University	Fire effects on a special concern species, the eastern box turtle	14-3-01-30
Madelyn Tucker	Wayne State University	Can the arrangement of pine barrens mediate the spread of wildfires under various climate change scenarios?	14-3-01-32
Breeanne Jackson	Ohio State University	Fire and food webs in Yosemite National Park: Implications of fire regimes on linked stream-riparian ecosystems	14-3-01-37
Johanna Freeman	University of Florida	Food, fuel, and fire: Assessing the effects of fuel treatments on wildlife habitat quality in longleaf pine-wiregrass ecosystems	14-3-01-43
Casey Brown	University of Alaska - Fairbanks	Understanding the effects of wildfire severity on moose habitat characteristics and use in Interior, Alaska	14-3-01-44

Interagency Fuels Treatment Decision Support System Approved!

The JFSP Governing Board thanks everyone who has contributed to the design, testing, and evaluation of IFTDSS.

A key problem reported by the fuels treatment planning community is the difficulty and inefficiency of having to evaluate and then apply the large number of planning tools and applications. Fuels specialists have struggled to find, load, and learn all of the different fuels and fire planning models, not to mention the interface of running, adjusting, and inputting data specific to each model without the ability to easily share inputs/outputs between models. The Interagency Fuels Treatment Decision Support System (IFTDSS) was conceived as a way for users to learn one interface, access a variety of data and models all in one place, and pass data (inputs and outputs) easily between models. IFTDSS provides planners with the structure to reuse and share their work products and provide a consistent basic analysis framework for all users.

The JFSP sponsored the design, prototype, early development, and evaluation of IFTDSS beginning in 2008 and continuing through 2013. The JFSP worked closely with fuels managers throughout that entire time period garnering feedback in order to ensure that IFTDSS was focused firmly on proposed user needs and priorities. Those efforts were recently acknowledged when the Wildland Fire Information and Technology Executive Board formally approved IFTDSS on May 30, 2014, for further planning, development, and eventual operational deployment.

In its current form, there are still a number of improvements that need to be made before IFTDSS can be considered fully operational. IFTDSS will be managed as a

beta-test version for the next 2 years, with full deployment planned for 2017. With continued enhancements, IFTDSS could eventually become an official system of record for federal fuels treatment planning and be available for nonfederal users as well.

The U.S. Forest Service and the Department of the Interior are working with the Rocky Mountain Research Station's Wildland Fire Management Research Development and Applications team to outline the future planning and development of IFTDSS. It will take some time for new contracts to be put in place and for desired enhancements to be implemented, but the process has already begun. Check the IFTDSS website for the latest information (<http://iftdss.sonomatech.com/>).

You are invited and encouraged to become an IFTDSS beta tester by requesting an account on the system homepage. Additionally, in order to help improve IFTDSS, please provide comments, suggestions, and any other input through the IFTDSS feedback link located on the IFTDSS homepage. If you have questions about IFTDSS, please use the "Contact Us" link on the IFTDSS homepage.

Finally, this concludes the role of the JFSP in developing a working prototype version of IFTDSS. This has been an extremely rewarding project for the JFSP culminating in the hand-off of the project to the interagency community for final planning, development, and implementation. The JFSP Governing Board thanks everyone who has contributed to the design, testing, and evaluation of IFTDSS.

Coming Soon - Fuel Treatment Science Plan

Fuels treatment effectiveness and fire effects research has been a mainstay of JFSP research since founding in 1998. The JFSP Governing Board recently commissioned retired wildland fire and fuels experts Tom Zimmerman, Rich Lasko, and Merrill Kaufmann to develop a multiyear fuel treatment science plan to guide future JFSP investments. An extensive literature review has been completed, and three initial themes have been identified, including:

- Effectiveness of fuel treatments in achieving desired fire behavior at treatment unit scales.

- Effectiveness of fuel treatment in achieving resilient landscapes, reducing wildfire suppression costs, and enhancing firefighter safety at landscapes scales.
- Management tools, guides, and references.

While the plan is still in the early stages of development, four key program elements will be addressed, as shown in table 4.

Fuels treatment effectiveness and fire effects research has been a mainstay of JFSP research since founding in 1998.

Table 4. Four key program elements of the fuel treatment science plan

Inventory	Fuel Treatment Planning	Fuel Treatment Implementation	Fuel Treatment Monitoring and Evaluation
The assessment of the social, political, and ecological considerations affecting and affected by fuel treatments.	The process of analyzing situational information, reviewing treatment capability, setting desired objectives, projecting effects of various treatment options, and developing a course of action to accomplish objectives.	The process of implementing the treatment plan to achieve fuel treatment objectives at appropriate temporal and spatial scales for all objectives.	The process of short-term examination of the completeness of the planning process, short-term examination of how well the implementation activities accomplished objectives, and long-term evaluation of effects and longevity of treatments.

Get the Answers You Need...FAST!

You spoke.

We listened.

You spoke. We listened. All JFSP publications can now be found easily in one place, and you can search for research results that meet YOUR needs in YOUR region.

The screenshot shows the FIRESCIENCE.GOV website. At the top, there is a navigation bar with links: Home, Funding, Research, Publications, Newsletters, and a search bar. A green arrow points to the 'Publications' link, with the text 'New Publications Tab' next to it. Below the navigation bar, there is a section titled 'Publications' with sub-tabs: Digests, Briefs, and Syntheses. A green arrow points to the 'Briefs' tab, with the text 'Choose your publication preference' next to it. Below the tabs, there is a list of publications with columns for Issue No. and Title. The list includes three items: Issue No. 17, Title 'Building Trust, Establishing Credibility, and Communicating Fire Issues with the Public'; Issue No. 16, Title 'Capturing Fire: RxCADRE Takes Fire Measurements to Whole New Level'; and Issue No. 15, Title 'Climate Change Tipping Points: A Point of No Return?'.

..and find fire science research results customized for your needs

The screenshot shows the FIRESCIENCE.GOV website's 'Research Results Search' section. At the top, there is a navigation bar with links: Home, Funding, Research, Publications, Newsletters, and a search bar. A green arrow points to the search bar, with the text 'Search for research results' next to it. Below the navigation bar, there is a section titled 'Research Results Search' with a form to find information by... The form includes several dropdown menus and checkboxes: Regional Consortium (Southern Rockies), Fiscal Year Project Completed, Principal Subject (Fire Effects), Ecoregion, Ecosystem Type, Study Type, Environmental Resource, Human Uses, Tool Type, and Phrase or word(s). A green arrow points to the 'Regional Consortium' dropdown, with the text 'Select your criteria' next to it. Below the form, there is a 'Search' button.

The screenshot shows the FIRESCIENCE.GOV website's 'Research Results' section. At the top, there is a navigation bar with links: Home, Funding, Research, Publications, Newsletters, and a search bar. A green arrow points to the search bar, with the text 'Your search results' next to it. Below the navigation bar, there is a section titled 'Research Results' with a message: 'The research results are the key findings from the final reports for completed projects. You found 42 results matching your query. Click on title to view detail information about a project.' Below the message, there is a list of research results. The first result is 'A National Study of the Consequences of Fire and Fire Surrogate Treatments' by James D. McIver, Principal Investigator. The second result is 'A Fire Severity Mapping System (FSMS) for Real-Time Fire Management Applications and Long-Term Planning' by Robert E. Keane, Principal Investigator. The third result is 'Fire and Fish Dynamics in a Changing Climate: Broad- and Local-Scale Effects of Fire-Induced Water Temperature' by Michael K. Young, Principal Investigator. Each result includes a brief description of the findings.

Critical, New Firefighter Safety Zone Research

The JFSP has funded the wildfire safety zone work of Bret Butler at the U.S. Forest Service Missoula Fire Sciences Laboratory for many years. Bret is a research engineer and has developed flat terrain safety zone recommendations for firefighters. As a result of his initial work, the JFSP funded Bret's additional research, which focuses on safe separation distances on slopes. Although results are preliminary and subject to change, this new research should be used to provide an extra margin of safety for all wildland fire personnel. U.S. Forest Service scientists Russ Parsons and Ruddy Mell also collaborated on the project by providing assistance formulating and running the computer simulations that form the basis of the modified rule. The calculation is based on vegetation height rather than flame height.

Note to firefighters: Watch for future releases, and check the date of the table.

Example from Existing Safety Zone Rule

Flames are 6 feet tall, wind speed is 10 miles per hour, slope is 20 percent, and sagebrush is 3 feet tall.

Radius of the safety zone = 4 x flame height =
4 x 6 feet = 24 feet

Example of Preliminary Proposed Rule

Wind speed is 10 miles per hour, slope is 20 percent, and sagebrush is 3 feet tall. Based on wind speed and slope, the slope/wind factor is 2, as shown in table 5.

Radius of the safety zone = 8 x slope/wind factor x vegetation height = 8 x 2 x 3 feet = 48 feet

In these two examples, with slope, wind speed, and vegetation height remaining the same, the calculated safe separation distance of the proposed rule is double the distance of the existing rule. The difference is due to the influence of wind speed and slope on fire intensity.

Disclaimer: This proposed safety zone rule should be considered preliminary and subject to increase or decrease based on analysis of additional data. Monitor www.firelab.org for updates.

... this new research should be used to provide an extra margin of safety for all wildland fire personnel.

Table 5. Table to determine slope/wind factor to use in the safe separation distance equation

New Preliminary Proposed Safety Zone Rule (July 2014)			
Calculating a Safe Separation Distance (SSD)			
SSD = 8 * slope/wind factor * height of the surrounding vegetation			
Slope-Wind Factor			
Wind Speed	Flat 0% Slope	20% Slope	> 30% Slope
Light 0-10 mph	1	2	3
Moderate 11-20 mph	2	3	5
Strong ≥ 20 mph	3	5	6

- Notes**
1. For a 20-person crew, add 10 feet of radius, and for a vehicle, add another 5 feet of radius.
 2. The area in red requires large natural openings or construction by mechanized equipment.
 3. The proposed rule is to be used for flat ground rather than the existing flame height rule.
 4. Also consider additional lookouts on the ground and in the air to monitor fire activity with early egress to escape routes and safety zones.
 5. At 30% or greater slopes, hot gases tend to stay close to the ground.

Thoughts from the JFSP Governing Board

The JFSP Governing Board is proud to serve the broader fire, fuels, and resource management community. We believe the research supported by the JFSP is of the highest quality and is directly relevant to many of the issues faced by today's managers. As a board, we ensure that JFSP investment strategies and science plans provide direction and focus and address high-priority research questions identified by managers and practitioners.

We hope all of you are engaged with your regional member of the JFSP Fire Science Exchange Network (described on pages 1-2 in this progress report; www.firescience.gov). The network is growing and maturing and is fast becoming the "go-to" spot to link fire science and management. If you are not connected to your regional fire science exchange, check it out.

We are also particularly proud of our GRIN award, which helps develop tomorrow's management and research leaders. Past GRIN award recipients are an impressive group of young fire scientists and managers.

Thank you for taking the time to peruse the 2014 JFSP Progress Report, and please let us know how we can better serve you.

Mike Balboni
U.S. Forest Service

Jim Menakis
U.S. Forest Service

Nate Benson
National Park Service

Karen Prentice
Bureau of Land Management

Ed Brunson
Bureau of Indian Affairs

Elizabeth Reinhardt
U.S. Forest Service

Rob Griffith
U.S. Forest Service

Matt Rollins
U.S. Geological Survey

Mark Kaib
U.S. Fish and Wildlife Service

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An Interagency Research, Development, and Applications Partnership



**Front and back cover photos:
Jayson Coil, www.jaysoncoil.com**

Jayson Coil is a battalion chief/paramedic with the Sedona Fire District and leads their wildland fire program. He's also a Type 1 operations section chief and structure protection specialist with 12 years of incident management team experience. Jayson uses his photography to increase awareness of the hard work that is done to protect communities from wildland fire. More of Jayson's photography can be seen at www.jaysoncoil.com

Learn more about the Joint Fire Science Program at

www.firescience.gov

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